Saskatchewan Ministry of Agriculture

CROP PRODUCTION NEWS

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CROP PRODUCTION

PRODUCTION

Editor's Comments

Ray McVicar, Crop Development Branch (ray.mcvicar@gov.sk.ca)

The much-needed sunshine and heat since the last Crop Production News publication were welcomed in many areas of the province to get the crops moving forward. Some regions did not receive as much rain as others, so we will need more showers throughout the growing season.

To check the progress of Saskatchewan's crops throughout the growing season, see the Saskatchewan Ministry of Agriculture *Weekly Crop Report* at: www.agriculture.gov.sk.ca/Crop-Report.

Some crop protection operations were delayed in June to match crop and pest stages. The insect development maps, included in this edition of the CPN, verify that we have had a slower spring this year. Our attention now turns to disease and insect control. For information on crop protection products, check out the *Guide to Crop Protection 2008* at www.agriculture.gov.sk.ca/Guide_to_Crop_Protection.

If you run into a pest that you cannot identify, you can submit a sample to the Crop Production Laboratory. For information on how to submit a sample to the lab, look at the Saskatchewan Agriculture website at: www.agriculture.gov.sk.ca/programs-services and scroll down to Crop Protection Laboratory Services.

NOTE: Throughout this document you will see that some publications are in blue font and underlined, indicating links to website information. If you are reading this off your computer screen, press the CTRL button and click your cursor on the link to take you directly to the website. ✪

Crop Production News is a biweekly publication prepared primarily by provincial specialists with the Crop Development Branch of the Saskatchewan Ministry of Agriculture. The newsletter includes a compilation of articles related to entomology, plant pathology, weed science, soils and agronomy issues.

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INSIDE

Crop Protection Lab Update

By Grant Holzgang, Supervisor, Crop Protection Laboratory (CPL)

Symptoms of environmental injury continue to be a concern for growers. Recent submissions to the CPL indicate herbicide drift onto adjacent sensitive crops is another area of concern. Herbicide injury on target crops is also being seen when conditions are less than ideal at the time of application.

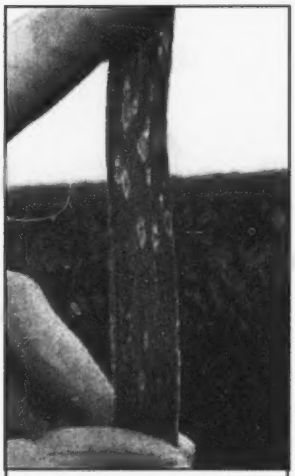

Figure 1: Tan Spot on Wheat
Source: Saskatchewan Agriculture

Tan Spot (*Pyrenophora tritici-repentis*) has been affecting winter wheat and it is expected to show up on spring wheat as well. Physiological leaf spots are also being observed on winter wheat. Growers should take the time to make a positive identification of the leaf spot cause before making a fungicide application. Leaf spots caused by pathogenic organisms usually have a chlorotic halo around the lesion (Figure 1) compared to a physiological leaf spot, which usually lacks this chlorotic halo.

Other recently submitted samples show wireworm injury continues to be an issue. As many crops have advanced past the seedling stage, they are less apt to be killed by wireworms, but the feeding injury allows pathogens to penetrate into the roots. ☼

Reducing Drying Time of Cut Hay

By Michel Tremblay, Provincial Specialist, Forage Crops

From standing crop to the cow's stomach, the goal of conscientious hay growers is to minimize dry matter losses as the crop is cut, cured, baled, transported and, finally, fed. One of the points at which large dry matter losses can occur is when the crop is cut and field-cured to a moisture content that will allow for storage with minimal risk of spoilage. Curing hay in the field exposes it to dry matter losses due to post-cut plant respiration, microbial degradation as well as bleaching and leaching due to sun and rain. Extended drying times increase losses due to: respiration within the plant (greatest immediately after cutting, when moisture content is high); microbial activity; and oxidation of vitamins and minerals. When drying a hay crop, the primary goal is to reduce the amount of time required to field-cure the hay to the desired moisture content. Some factors to consider when reducing drying times include:

Temperature
Higher air temperatures will result in faster drying, but relative humidity will have a significant impact on drying rates at a given temperature.

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Reducing Drying Time of Cut Hay

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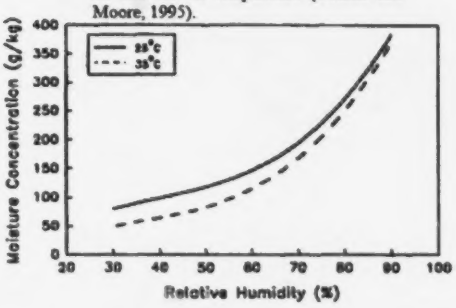

Figure 5. Equilibrium moisture content of hay is proportional to the relative humidity in the air and the air temperature (Collins and Moore, 1995).

Relative Humidity

Drying rate is inversely proportional to relative humidity (Figure 5). Drying rates and equilibrium moisture levels at a given temperature will vary according to the relative humidity percentage.

Timing of Cutting

Crop development can have a significant impact on how quickly hay will dry down. As the hay crop matures, the moisture content of the crop declines. Pre-boot grass has a moisture content of 80 to 90 per cent. Boot stage grass has a moisture content of 70 to 80 per cent. Flowering grass has a moisture content of 50 to 70 per cent, and grass in the seed-set stage of development can have 50 per cent or less moisture. Cutting at a later stage of development, in order to reduce field-curing time, has to be balanced with the fact that forage quality declines as the plant matures.

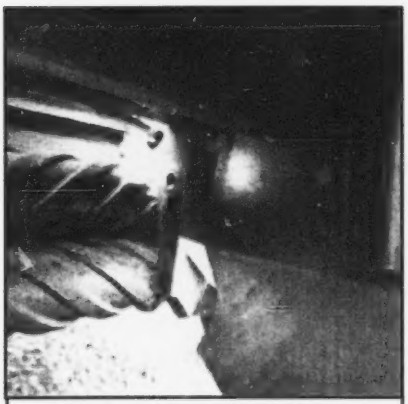

Figure 1: Correct spacing and tension on the conditioning rollers (left), and adjustment of the crop deflector (above) and windrow forming shields (right) result in quick drying with minimal crop damage.
Source: Saskatchewan Agriculture

Conditioning

Successful conditioning occurs when 90 per cent of the stem is cracked or exhibits a reduction in rigidity, but with less than five per cent of the leaves exhibiting signs of bruising or blackening. The conditioning roller gap (Figure 1) and roller pressure should be set to achieve these results. Conditioning action should be checked in each field, as crop kind, windrow size, stem diameter, maturity level and moisture content of the crop will impact conditioning action. Windrows should be made as wide as possible to speed drying.

Packaging

Bale type will dictate safe moisture levels for storage. Generally, small, medium and large square bales will safely store at 15 per cent moisture; hard-core round bales at 18 per cent; and soft-core round bales at 20 per cent moisture.

Additives

Hay preservatives can be applied to hay at baling to reduce microbial activity, thereby reducing dry matter losses. Acid-based additives reduce microbial activity by reducing the pH of the hay. Biological additives contain cultures of organisms that inhibit harmful fungal growth. The cost of additives must be considered when determining the value of quality hay.

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Reducing Drying Time of Cut Hay **(Continued from page 3)**

Consideration of the above factors will allow the producer to minimize field-drying time and dry matter losses and maximize feed quality and yield. (given the prevailing climatic conditions). ✿

Preventing the Spread of Leafy Spurge

By Elaine Moats, Crop Development Specialist, Weyburn

Figure 1: Leafy spurge patch
Source: Saskatchewan Agriculture

The increase in the number of new leafy spurge patches (Figure 1) along many highways and roads is a stark reminder of past hay shortages experienced by farmers in some parts of the province. These patches also serve as a warning to those who mow ditches as well as buy and haul hay.

Leafy spurge (*Euphorbia esula* L.) is the most difficult weed to control (next to field bindweed). Frequently referred to as a prohibited noxious weed, this weed really doesn't have any weak spots. It can produce 140 seeds per stem and, at maturity, is capable of throwing the seeds four metres as the seed pod splits. Its roots can grow to a depth of about eight metres and spread about four metres. A leafy spurge plant can spread up to a metre per year just with vegetative growth. It is also capable of spreading and reproducing from root buds that break off during cultivation. The seed has an estimated dormancy of about seven years. To top it off, the milky latex in the stems and leaves irritate the mouths of cattle and horses, limiting grazing control options.

Spread prevention is the first step in the management of this weed. Do not buy hay infested with leafy spurge! There are countless examples of unmanageably large leafy spurge patches that originated from leafy-spurge-infested hay transported from Manitoba during past drought years.

As trucks deliver loads, leafy spurge seeds drop off and eventually establish plants along the shoulders of roads. The same is true for grain trucks and rail cars hauling infected grains – the seeds may shake out and start new infestations. People mowing road, highway or railroad rights-of-way or performing any haying operation can transport leafy spurge seeds when they move their equipment or hay. Avoid baling these sites!

Report new sites to the local municipal administrator or R.M. weed inspector. Many rural municipalities have weed control programs and work with the Ministry of Highways

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Preventing the Spread of Leafy Spurge **(Continued from page 4)**

and Infrastructure and the railroad companies. Controlling known leafy spurge sites with appropriate herbicides and long-term monitoring will go a long way toward preventing further spread and eradicating this problem.

Mowing roadsides to prevent seed set can be useful, provided the operation is done early—before seed development. Mowers need to be cleaned after going through the patch to prevent seeds from being transported.

Chemical control of patches is usually based on the use of Tordon 22K in mid-June when chemical uptake by plants is best. Other useful products include 2,4-D, Amitrol and glyphosate.

Biological control with beetles is a long-term control measure usually reserved for large infestations where spraying is impossible or impractical.

For more information about leafy spurge control, contact your nearest Saskatchewan Agriculture Crop Development Specialist or the Agriculture Knowledge Centre at 1-866-457-2377.

Timely Termination of Organic Green Manures

By Chantal Stumborg, Provincial Specialist, Organic Crops

Legume green manures are a key element in many organic rotations, and growers often question how to optimize the potential nitrogen benefit, minimize soil water use, enhance weed control and choose an effective termination method, while still protecting the soil from erosion. After choosing a green manure that fits within the rotation, it all comes down to the timing and method of termination. The most common legume green manures in Saskatchewan include annuals such as pea, lentil and chickling vetch, biennials like red clover and sweet clover, and perennial alfalfa.

Figure 1: Discing sweet clover green manure
Source: Natural Systems Agriculture, University of Manitoba

Timely green manure incorporation is important to minimize soil moisture use while maximizing nitrogen benefit, especially in drier regions of the province. The majority of legume nitrogen fixation occurs prior to the flowering stage, and nodule activity slows as the plant enters the reproductive phase of its life cycle. With annual legumes like pea,

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Timely Termination of Organic Green Manures **(Continued from page 5)**

lentil and chickling vetch, incorporation should occur at 10 to 20 per cent bloom in average moisture conditions, and earlier, at budding, if conditions are dry. For biennial crops like sweet clover, incorporation from budding to 10 per cent bloom is encouraged, to minimize moisture use.

Termination of legume green manures is typically done using one or two passes of a heavy discer or cultivator, depending on the stand density and ease of incorporation. If sweet clover is left until late bloom, the heavy stand will be more difficult to turn under. Some growers have used rotary mowers to cut sweet clover, and left the residue on the soil surface for later incorporation. This reduces operational costs, but evidence has shown that nitrogen can be lost through volatilization from decomposing sweet clover residues on the soil surface.

Research into minimizing tillage in organic systems is underway at the University of Manitoba, where the blade roller is being studied in lentil, oat/pea, chickling vetch, fababean and hairy vetch green manures. The modified roller has blades which crimp the base of the plant stems, essentially killing the crop, while rolling it to the ground. The residue remains on the surface to minimize soil erosion, increase soil moisture retention and enhance weed control for the remainder of the season. The slower residue decomposition rates may have some drawbacks, such as reduced nitrogen availability to subsequent crops and nitrogen volatilization losses, but research is still ongoing.

Timing is the key to legume green manure incorporation and, in drier spring conditions it may be prudent to terminate green manures earlier to avoid yield losses in subsequent crops. ☼

Pea Leaf Weevil in Southern Saskatchewan

By Dale Risula, Provincial Specialist, Special Crops

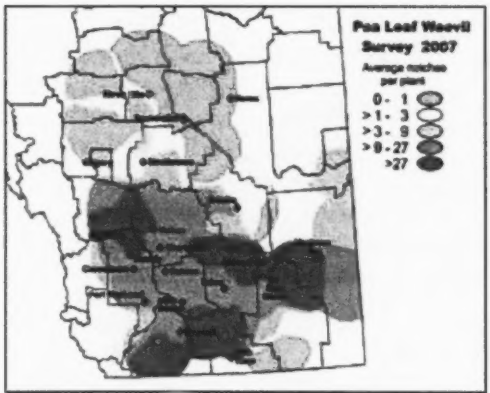

Figure 1: 2007 Alberta pea leaf weevil survey
Source: Alberta Agriculture and Rural Development

Pea leaf weevil (*Sitona lineatus*) originates in Europe, but was first found near Lethbridge, Alberta, only eight years ago. The insect has spread rapidly in Alberta, and is now found in many of the crop districts throughout that province. The most recent survey map from Alberta (Figure 1) shows its area of infestation.

In 2007, a similar survey was conducted in Saskatchewan. Confirmation of pea leaf weevil was made when damaged pea crops

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Pea Leaf Weevil in Southern Saskatchewan **(Continued from page 6)**

were found near Maple Creek.

The survey map was created (Figure 2) to delineate the areas of infestation, mostly in the extreme southwest.

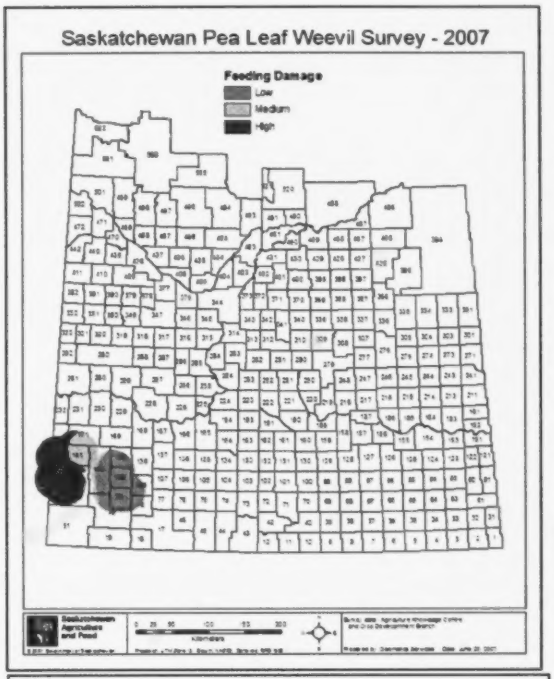

Figure 2: Pea leaf weevil survey
Source: Saskatchewan Agriculture

Because weevil adults are able to walk and fly, the area of infestation will likely increase in Saskatchewan as it did in Alberta. When temperatures warm to 17° C, adult beetles become active and begin to invade pea fields. Usually, the first signs of damage are found in field margins.

The initial damage is found on the vegetative portions of the plant. Later, larvae will damage the root nodules too. Other leguminous plants are at risk, but lentils appear to be safe from this insect. The adult weevil (Figure 4) is very small and gray, averaging about five mm in length, and closely resembles a clover leaf weevil. Because it is so small, it is often difficult to see.

The easiest way to assess damage is to look for notches in leaves of pea plants and then determine if the threshold level has been reached. The current threshold recommendation is damage (one notch or more per plant) to 30 per cent of the pea plants. If the first leaves to emerge (clam leaves) are damaged, then insecticide should be sprayed to control the weevils. If damage has occurred to the leaves that emerged after the clam leaves, then it's probably too late to take action because the weevils would already have laid their eggs in the soil near the plants. Figure 3 depicts typical vegetative damage from weevil adults.

Figure 3: Pea leaf weevil damage
Source: Saskatchewan Agriculture

Later in the summer when the eggs hatch, small white larvae (3.5 to 5.5 mm in length) (Figure 4) burrow down to the rooting

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Pea Leaf Weevil in Southern Saskatchewan **(Continued from page 7)**

zone where they feed on the nitrogen fixing nodules of the plant.

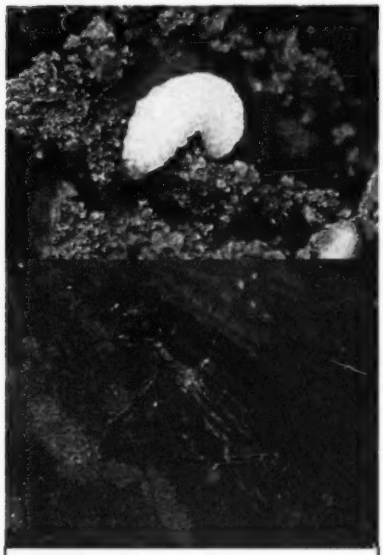

Figure 4 Top: Weevil larvae.
Bottom: Weevil adult.
Source: Dr. Henry Goulet, AAFC

The effect of this damage is not yet fully known. It is currently being studied by Agriculture and Agri-Food Canada in Alberta.

Ideally, if thresholds have been reached, it is advantageous to spray early (two to three above-ground node stage) to control adults before they lay their eggs. Damage caused by the larvae is likely to be considerably greater than what adults contribute from chewing on vegetative parts.

Nodules are necessary to fix nitrogen for the plant, and the larvae may slow or stop nitrogen fixation.

Registered control measures include the seed treatment Cruiser 5FS or a foliar application of the contact/ingestion insecticide Matador. Sygenta Crop Protection claims Cruiser 5FS is compatible with nitrogen-fixing inoculants.

A weevil survey was conducted in June 2008 in Saskatchewan, and the final map will be published on the Saskatchewan Agriculture website. Preliminary estimates indicate that the weevils have spread, and could move throughout Saskatchewan in the future. Pest awareness, control measures, weather and weevil predators will be important factors to limiting its advance. ☼

Septoria Leaf Mottle on Canaryseed

By Blaine Recksiedler, Provincial Specialist, Cereal Crops

With approximately 170,000 seeded hectares in 2008, Saskatchewan is a major producer and exporter of canaryseed. The market is characterized by large price swings, quite often affected by production fluctuations in Saskatchewan. Commercial bird feed is made by blending crops such as millet, safflower, canaryseed, flax and canola. Research is underway to explore potential human food markets for canaryseed.

Canaryseed is a cool season crop that does best in long, warm days and cool nights. It matures in approximately 105 days. Canaryseed is shallow rooted. It is more sensitive to heat and less drought- and salt-tolerant than wheat. It is well adapted to heavy, moisture-retaining soils. Major areas of production in Saskatchewan are near Kindersley, the Regina plains and Melfort.

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Septoria Leaf Mottle on Canaryseed **(Continued from page 8)**

Figure 1: Late symptoms of septoria leaf mottle.
Source: Saskatchewan Agriculture

Septoria leaf mottle (Figure 1) is a residue-borne disease caused by the fungal pathogen *Septoria triseti*. It prefers wet conditions and a dense crop canopy.

Growers should examine their fields for the disease, which can be identified by the appearance of "green islands" on the lower leaves. These are infected spots that remain green as the rest of the leaf yellows. Early symptoms can be difficult to recognize, as the contrast between healthy green leaf area and diseased leaf area is not pronounced. Close inspection of the diseased area or discoloured leaf tips will reveal a large number of pycnidia (small, black, spore-producing bodies). A magnifying glass will assist in identifying pycnidia that are embedded in the leaf. Under wet conditions, pycnidia ooze golden brown globs of spores that are spread to healthy leaves by rain drops. In severe infestations, the pycnidia can cover the entire plant, including the head. When the pycnidia are present on the head, spores will most likely find their way onto the seed during harvest. It is not known if these spores can survive on the seed throughout the winter, but it is advisable to obtain different seed if infection is likely.

Canaryseed crops sown into canaryseed stubble are at high risk of infection. A crop rotation with at least a two-year break from canaryseed is the best way to reduce economic infestations of the disease.

Tilt 250E, Bumper 418 EC and Pivot 418EC are foliar fungicides registered for the suppression of septoria leaf mottle in canaryseed. Consult the product label or the Saskatchewan Agriculture publication *Guide to Crop Protection* for more information. The best time for fungicide application is when the flag leaf is emerging.☼

Insect Development and Temperature

By Scott Hartley, Provincial Specialist, Insect and Vertebrate Pests

Insect development, similar to plant growth, is closely related to climatic conditions. Generally, temperature is the primary regulating factor, but precipitation is also important.

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Insect Development and Temperature **(Continued from page 9)**

Each insect species will experience optimum growth between certain minimum and maximum temperatures because enzymes that regulate metabolism will only function efficiently within these temperatures. Below the minimum temperature, development is reduced or suspended. Temperatures above the maximum for a species will also result in reduced or arrested development. Extremes above or below this range can also result in the death of the organism. A specific number of heat units accumulated within the acceptable temperature range is necessary to complete each stage in the life cycle of an insect. The heat units required by an insect to complete each phase in a temperature-based physiological time scale are measured in degree-days (D°D). Degree-days are calculated using recorded temperatures for a single day, and then accumulated during the growing season as a running total using a base temperature specific to the insect. For example, emergence of adult wheat midge from the soil commences at about 700 accumulated D°D, and peak emergence is predicted at about 800 D°D under normal soil moisture conditions.

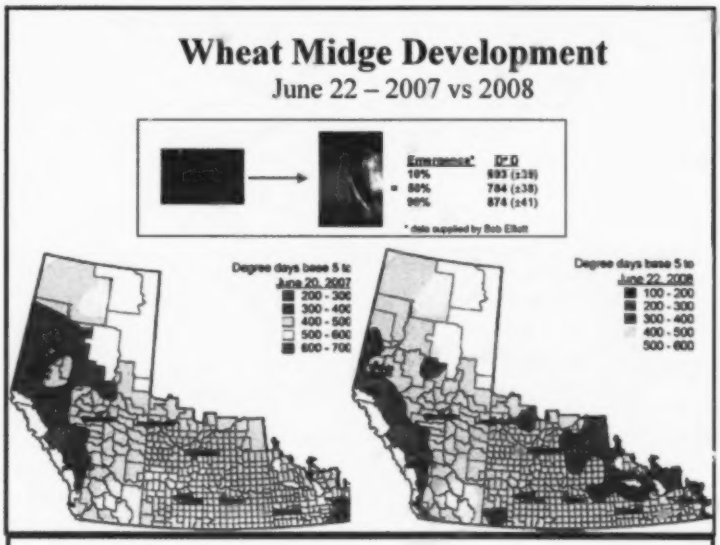

Figure 1. Wheat Midge. Source: AAFC

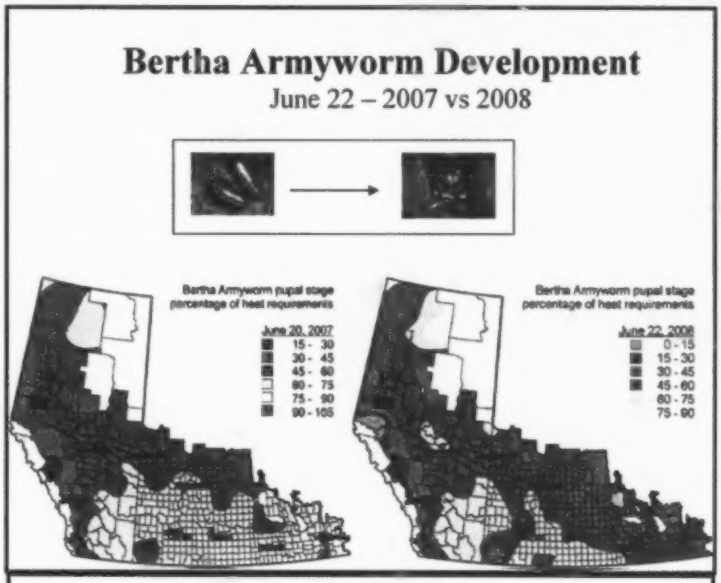

Figure 2. Bertha Armyworm. Source: AAFC

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Insect Development and Temperature **(Continued from page 10)**

During the spring and summer, Agriculture and Agri-Food Canada (AAFC) uses data from Environment Canada and other sources to produce development maps specific to each insect. The maps on the previous page are for wheat midge (base 5°C) (Figure 1) and bertha armyworm pupal development (Figure 2) up to June 22, 2008, along with maps from June 20, 2007, for comparison. The maps indicate that the spring season of 2008 has been cool, and insect development relatively slow. ✿

Recognizing and Managing Leaf Spot Diseases of Wheat

By Faye Dokken, Provincial Specialist, Plant Diseases

Leaf spot diseases tend to be ubiquitous in Saskatchewan wheat crops. According to the latest Canadian Plant Disease Survey, wheat crops suffered an average 3.5 per cent infection rate from leaf spot diseases in 2007, similar to the previous two years. In 2007, Tan spot (*Pyrenophora tritici-repentis*) was the most prevalent leaf spot pathogen, followed by septoria blotch (*Septoria tritici*) and stagonospora blotch (*Stagonospora nodorum*), then spot blotch (*Cochliobolus sativus*). Spring and durum wheat values have risen this year, and protecting the estimated 12 million acres across Saskatchewan from pest damage is an increasingly important task. Leaf spot diseases are helped by wet weather and warm temperatures, and the June rainfall in many areas of the province reminds us to watch out for these pathogens.

Tan spot (yellow leaf spot): Initial symptoms are small, dark brown to black spots, which develop longitudinally along the veins, forming tan, oval-shaped lesions. If visible, a central dark spot in the lesion corresponds to the initial infection site and a chlorotic halo may surround the lesion.

There may be tiny spores (conidia) visible on the leaf surface, but tan spot does not form fruiting bodies (pycnidia). This pathogen can also cause red or pink smudge and black point on infected wheat kernels.

Septoria blotch: Initial symptoms are yellow flecks, which expand into yellow, grayish, white or brown blotches on all above-ground plant parts. Leaf lesions are yellow-bordered and restricted by the veins, developing longitudinally with parallel sides and blunt ends. Pycnidia develop within the blotches, and are dark, small and conspicuous within the restricted rectangular region of the lesion.

Stagonospora blotch: Initial symptoms are yellow flecks on leaves, which enlarge to oval or lens-shaped blotches, light in colour, with dark margins surrounded by chlorosis. Pycnidia develop within lesions, and are dark, small and inconspicuous.

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Some wheat varieties have better leaf spot disease resistance than others, and this affects the amount of disease pressure your crop can withstand. Consult the publication *Varieties of Grain Crops* for more information.

Foliar fungicides registered for control of leaf spot diseases in wheat
(Source: Saskatchewan Agriculture)

Product	Active Ingredient	Company	Systemic / Contact	*Timing Options*	Herbicide Tank-Mix?
Bravo 500	Chlorothalonil	Syngenta	Contact	- Flag leaf emergence	No
Bumper 418EC	Propiconazole	United Agri Products	Systemic	- Tillering to heading	*Yes*
Dithane DG	Mancozeb	Dow AgroSciences	Contact	- 3 leaf to tillering - Prior to flowering	No
Folicur 432F	Tebuconazole	Bayer CropScience	Systemic	- At early disease - To end of flowering	*Yes*
Headline EC	Pyraclostrobin	BASF	Systemic	- Flag leaf emergence	No
Manzate	Mancozeb	E.I. du Pont Canada	Contact	- 3 leaf to tillering - Prior to flowering	No
Penncozeb 75DF	Mancozeb	United Agri Products	Contact	- 3 leaf to tillering - Prior to flowering	No
Pivot 418EC	Propiconazole	Interprovincial Cooperative	Systemic	- Tillering to heading	*Yes*
Proline 480SC	Prothioconazole	Bayer CropScience	Systemic	- At earliest disease	No
Stratego 250EC	Propiconazole & Trifloxystrobin	Bayer CropScience	Systemic & Contact	- 4 leaf to flag stage - Before heading	*Yes*
Tilt 250E	Propiconazole	Syngenta	Systemic	- Early season ½-rate - Flag leaf emergence	*Yes*
Quilt	Azoxystrobin & Propiconazole	Syngenta	Systemic & Contact	- Stem elongation to half-head emergence	No
* Consult *Guide to Crop Protection* and corresponding product labels for more information. *					

Lesions caused by leaf spot diseases decrease the photosynthetic area of leaves, resulting in reduced yields, particularly when the penultimate (last leaf before the flag leaf) and flag leaves are affected. Yield losses generally range from three to 15 per cent, but can be as high as 30 to 40 per cent. Foliar fungicides applied at early stages help stop leaf spots from spreading, while later applications aimed to protect the flag leaf prevent yield loss. Contact fungicides prevent spores from germinating and infecting leaf tissue, while systemic fungicides move within the plant tissue, protecting healthy leaf tissue from expanding infections. In order to protect the flag leaf, contact fungicides require good coverage of the fully extended flag leaf, while systemic fungicides are most effective if applied at the beginning of flag leaf emergence.

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Recognizing and Managing Leaf Spot Diseases of Wheat **(Continued from page 12)**

If crop scouting reveals symptoms of wheat leaf spot disease, review fungicide options (Table 1) while considering potential risk and disease pressure, yield potential and economic benefit, as well as appropriate selection of fungicide activity, rate and timing.

The ***Crop Production News*** is a regular publication of the
Crop Development Branch, Saskatchewan Ministry of Agriculture.
Editor: Ray McVicar, Manager – Production Technology Section; Phone: (306) 787-8733;
e-mail ray.mcvicar@gov.sk.ca